



History of Blood Transfusion in Sub-Saharan Africa

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ABSTRACT

The adequacy and safety of blood transfusion in sub-Saharan Africa is the subject of much concern, yet there have been very few studies of its history. An overview of that record finds that transfusions were first reported in Africa (sub-Saharan and excluding South Africa) in the early 1920s, and organized transfusion practices were established before the Second World War. Blood transfusion grew rapidly after 1945, along with the construction of new hospitals and expanded health services in Africa. Significant differences existed between colonial powers in the organization of transfusion services, but these converged after independence as their use continued to grow and decentralized and hospital-based practices were adopted. It was only after the oil crisis in the mid-1970s that health spending declined and the collection, testing, and transfusion of blood began to level off. Thus, when the AIDS crisis hit transfusion services, they were already struggling to meet the needs of patients. At this time, foreign assistance as well as the World Health Organization and the League of Red Cross Societies helped respond to both the immediate problem of testing blood, and for some countries, support existed for the broader reorganization of transfusion. Overall, the history shows that transfusion was adopted widely and quickly, limited mainly by the availability of knowledgeable doctors and hospital facilities. There was less resistance than expected by Africans to receive transfusions, and the record shows a remarkable flexibility in obtaining blood. The dangers of disease transmission were recognized from an early date but were balanced against the potential lifesaving benefits of transfusion.

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CONCERNS ABOUT THE adequacy and safety of blood transfusion in sub-Saharan Africa have made that region the subject of a number of reports and monitoring in recent years [1–3]. However, there have been very few studies of its history. This information is important beyond the value of providing perspective for the many current efforts to improve transfusion practice [4,5]. It also offers a lesson about how a major medical advance with lifesaving benefits was adopted in a region with its own healing traditions.

Transfusion began during the period of European colonial rule that, for most of sub-Saharan Africa, lasted from the end of the 19th century to the 1960s. It was not a simple process because transfusion could not be quickly begun or practiced exactly as it was in Europe or other places where the techniques were first worked out. It required hospitals and trained doctors as well as some important procedural modifications to be widely available in Africa.

An overview of the history shows some broad similarities and striking differences, depending on the region and period. These, in turn, reflect influences that continue to this day and thus have an impact on efforts to improve current transfusion medicine. In addition to demonstrating the need for more detailed histories for different countries, this overview can serve as an introduction that also identifies some important questions that warrant closer examination [6]. These include who donated blood, who received transfusions, and

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Table 1
Transfusions reported (>10 annually) in African colonies by World War II [7]

Colony	Date and notes
Belgian Congo	1924, Haut Katanga, 300 patients; 2 other locations by 1940
Uganda	1931 first blood grouping reports from Kampala
Kenya	1932, Nairobi, 24 donors
Tanganyika	1932 first blood grouping reports
French Congo	1933, Brazzaville
Ethiopia	1935
Gold Coast	1935 first blood grouping reports
Sierra Leone	1936 first reports, 38 in 1938
Rhodesia	1939 report of 903 donors list
Senegal	1940 report of 813 blood groupings in French West Africa
French Soudan	1941, 300 blood group tests

what were the risks from contaminated blood including the extent to which transfusion spread HIV and other diseases.

The Key Role of Physicians and Hospitals

Transfusions were first reported in Africa (sub-Saharan and excluding South Africa) in the early 1920s, and the development of organized transfusion practices occurred before the Second World War (Table 1).

Thus, between the 2 World Wars, all conditions existed in sub-Saharan Africa which were necessary for blood transfusions to take place: availability of donors, willing patients, and doctors with the knowledge and technical ability to do transfusions. The evidence also suggests that the numbers of transfusions were limited primarily by the availability of Western medical doctors and facilities to do transfusions.

This new medical procedure often began through access to knowledge and resources outside the usual colonial medical structures. Thus, the first reports of systematic transfusions in the early 1920s were from hospitals established to support mining operations in the Katanga region of the Belgian Congo [8,9]. Later, transfusion services were reported at Kisantu (Lower Congo) and Kivu Province of Eastern Congo, where the Medical Faculty of the University of Louvain in Belgium had established hospitals [10,11]. The Red Cross played an important role in supporting transfusion in Anglophone African colonies before the Second World War, but in Francophone Africa, transfusions began when doctors with appropriate training began entering the colonial health service run by the Ministry of Marine [12–14].

During the period before 1945, blood transfusion in Africa was organized by and practiced in hospitals. Because it depended on a knowledgeable doctor and appropriate facilities, early transfusions in Africa were favored at the larger hospitals in capital cities where there

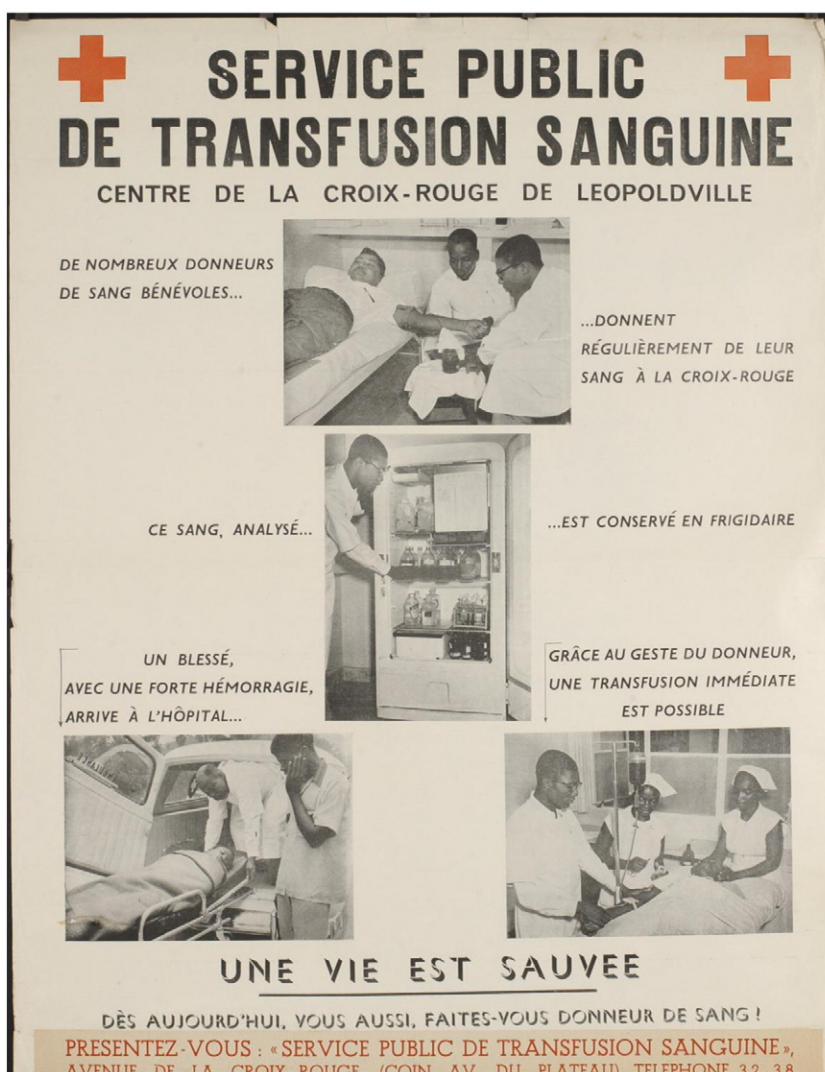


Fig 1. Poster for Centre de transfusion sanguine du Congo, 1958. Source: BBT-2002-24-13_a029jb, archives of Musée International de la Croix Rouge, Geneva.

Table 2
Growth of blood transfusion during 1960s and 70s in selected African locations [28–33]

Location	Transfusions (no. per year)	Date	Transfusions reported at or near independence
Benin (Cotonou)	2202	1972	1325 (1962)
Cameroon (Yaoundé)	4543	1972	528 (1960)
Cameroon (Douala)	1825	1972	
Chad	2376	1976	1467 (1960)
Congo (Brazzaville)	6103	1972	128 (1960)
Kenya (Nairobi)	16 324	1973	5112 (1963)
Nigeria (Ibadan)	8773	1973	5770 (1960)
Senegal (Dakar)	11 695	1970	10 114 (1961)
Sierra Leone	2049	1970	1148 (1959)
Tanzania (Dar es Salaam)	2500	1965	907 (1960)
Uganda	34 311	1970	14 000 (1963)
Zaire (Kinshasa)	5702	1972	3317 (1960)
Zambia (Lusaka)	6993	1971	
(Ndola)	5713	1971	

might be 3 to 4 doctors including at least 1 surgeon, or hospitals with special outside links such as those supported by the University of Louvain and the Union Minière in the Belgian Congo. Transfusion was also introduced when a doctor who had practiced it at one location brought that experience to a new hospital assignment. This was the case with Joseph Lambillon when he arrived at Katana Hospital in Kivu (Belgian Congo) in 1939 and, later, when he moved from Kivu to Leopoldville after the Second World War [15]. Similarly, Gaston Ouary helped introduce transfusion in Dakar before and during the Second World War and continued the practice when he moved to Brazzaville in the French colonial health service after the war [16,17].

In addition to a knowledgeable doctor, the availability of donors also influenced whether the procedure was done in this initial period. For example, in 1940, Lambillon and Denisoff [10] stressed the possibilities of blood donation from recovering patients in African hospitals, but more typically, family members were asked to donate. As to the uses of transfusion, there was some experimentation with treatment of pneumonia as early as the 1920s in Katanga because of the high incidence of that disease among mine workers [8,9], but more typical were surgery cases and difficult obstetrical deliveries. An experiment with anemic infants at Kisantu hospital in the Belgian Congo beginning in the early 1940s was a precursor of a practice that became more widespread after independence [12].

After the Second World War, policy decisions and other developments led to a much greater use of blood transfusions. Thus, when new hospitals were built in the 1950s, such as in Ibadan (Nigeria), Kampala (Uganda), and Lomé (Togo), or an existing one was enlarged, especially with a surgery wing, as was the case in Nairobi, they typically included the standard services for modern operations such as expanded laboratory facilities and a blood bank [18–21]. This gave big hospitals—for example, in capitals and growing

cities in relatively prosperous colonies such as Kenya and Uganda [22,23] the facilities that other hospitals did not have. As a result, their blood collection, testing, and banking facilities often became at least citywide services and, where feasible, sometimes reached nearby district hospitals. For example, in 1957, a citywide transfusion service was opened in Leopoldville, building on previous transfusion practice in the capital of Congo (Fig 1).

In Dakar, a transfusion center was established in 1951 with the very ambitious goal of providing blood not just for Senegal but also for all other colonies in French West Africa [24].

Blood donation in British colonies from the Second World War to independence followed the Red Cross model, whereby blood was expected to be donated voluntarily. French colonies, in contrast, generally followed the metropole model where the government compensated donors for their efforts [25]. There were pressures, however, that produced a mixture of paid and voluntary donation. In some of the British colonies, for example, there were hospitals that did not rely entirely on Red Cross voluntary donors [26]. Likewise, both the Red Cross units and the Dakar center recruited unpaid donors from places where there were significant elements of coercion: the army, civil servants, and factory workers, but above all, older school children and prisoners [19,22,24,27]. The practice in Senegal was that if donors came to give blood at the transfusion center, they were paid for their trouble and fed, but when mobile units went out to collect blood at a school or army barrack, there was no compensation [24]. The number of both voluntary and compensated donors grew significantly during this period.

Developments After Independence and the Role of International Assistance

After independence, transfusion continued to increase as most countries accelerated the building of provincial hospitals to serve regional needs. The organization of services also moved away from efforts to centralize collection and testing. This was partly in response to the higher cost and slowness of transport, but in other colonies, which never were able to centralize, such as Nigeria and Congo/Zaire, local hospitals were left to arrange for their own transfusion services, sometimes with voluntary donors assisted by the Red Cross, sometimes with paid donors, and sometimes both. Thus, after independence, there was a general swing away from centralization toward a more mixed organization. Regional services were limited at best, and smaller hospitals receiving blood deliveries took steps to supplement or complement collection and testing. In general, this was driven by an overall increase in the use of transfusion and the corresponding need for more donors (Table 2).

After the economic crisis of the mid-1970s, there were major changes in transfusion services because African countries no longer

Table 3
Examples of international assistance for development of blood transfusion services in Africa, 1964–2003 [6]

Year	Country	Assistance from	Notes
1964	Senegal	Common Market	Support for building expansion
1966–1971	Ethiopia	Canada	Israeli advisor and technician
1972–1981	Burundi	Switzerland	Building and technician
1973	Togo	Canada	Swiss administrative technician
1974–1994	Rwanda	Belgium, Switzerland	Created a true national service
1975	Gambia	Sweden	Unsuccessful
1976–1981	Upper Volta	Switzerland, Luxembourg	Support for new building
1978–1984	Angola	Switzerland	
1984–2000	Mozambique	Switzerland	
1989–1999	Uganda	European Commission	Reestablished national service
1998–present	Kenya	United States	2000–2001 (after embassy bombing); Japan, 2000; later US PEPFAR
2003	12 African countries	US PEPFAR (President's Emergency Plan for AIDS Relief)	Multimillion dollar funding for safe blood supply as part of campaign against AIDS

had adequate resources to continue, let alone keep up with new techniques in transfusion medicine. This limited their ability to draw and store blood or extend transfusion to more remote regions. Problems were exacerbated by growing concerns with testing and

safety, such as the need to screen hepatitis B, a new disease that was discovered well before the appearance of HIV [33–35]. One response was to seek funding from developed countries, especially in Europe, North America, and Japan. When successful, the result was a



Fig 2. Zambia Red Cross blood donation poster (no date). BBT-1988-107-13_A003GU, archives of Musée International de la Croix Rouge, Geneva.

recentralization of transfusion services nationally because it gave donor countries better ability to encourage efficiency and safety, as well as monitor how funds were used. These included Burundi (assisted by the Swiss Red Cross) and Rwanda (assisted mainly by the Belgian Red Cross) plus Uganda (assisted by the European Commission after 1987) and the Ivory Coast, but not all countries were able to secure outside funding [36,37] (Table 3).

Other pressure for centralization came from the growth of programs to assist blood transfusion at the World Health Organization and the League of Red Cross Societies, which, in addition to helping secure funding, also coordinated offers of technical assistance for setting standards of blood safety beginning in the mid-1970s [38,39]. For example, these 2 organizations cosponsored the first African blood transfusion workshops beginning in the Ivory Coast in 1977 and in Burundi in 1978 [40,41]. Thus, when the AIDS crisis hit Africa less than a decade later, some mechanisms were already in place to

support and coordinate efforts to monitor and ensure the existence of a safe blood supply.

Donors and Use of Blood Transfusions

Among the larger questions worth closer scrutiny is how blood transfusion was used. To be sure, as elsewhere, initially there were fears and myths that arose about whether significant numbers of Africans would understand and accept transfusion. For the most part, these fears were allayed by practitioners. One means of educating both donors and patients was with posters meant to show the use of blood as well as motivate those to give (Figs 2 and 3).

In fact, the needs were so extensive and the successful results of transfusion were so dramatic that, if anything, the overuse of transfusion became a bigger problem than resistance on the part of



Fig 3. Transfusion poster from Guinea (no date). BBT-2002-27-33_a017jb, Archives of Musée International de la Croix Rouge, Geneva.

Table 4
Uses of transfusion, Rwanda, 1976–1993 [51]

Year	Surgery	Ob-gyn	Pediatrics	Internal medicine	Other
1976	28.6	35.5	10.5	4.0	21.4
1977	30.5	29.2	7.2	6.3	26.8
1978	24.1	35.1	5.0	4.3	31.5
1979	11.8	37.1	7.5	6.2	37.4
1980					
1981 ^a	40.0	37.0	16.6	4.9	1.5
1982 ^b	32.5	29.6	13.5	14.1	
1982 ^a	35.2	43.1	14.9	6.2	
1983	34.9	34.6	16.0	13.5	
1984	38.5	35.7	9.6	15.4	
1985	34	33	14	14	
1986					
1987	33	29.4			
1988	30.5	24.2	26.2	18.7	
1989	33.7	26.0	26	14	
1990	30.5	22	32.5	15	
1991	28.5	22.5	32	17	
1992	27	24.2	36	13	
1993	25	21	34	20	

Values are presented as percentage of blood used by each hospital service.

^a Butare Hospital only.

^b Kigali Hospital only.

patients [42–44]. Hospital records are scarce in the early period and, most often, mention use for blood loss from accidents and general surgery, but after the 1980s, statistics show that transfusions were done increasingly for obstetric and pediatric (anemia) patients as these specialties became more widely available [45–50].

One country with particularly good records of use is Rwanda, which received support from the Belgian government for improving transfusion services from 1976 to the mid-1990s. Overall, transfusions increased, but the percentage for pediatrics increased significantly faster than other services (Table 4).

Other reports from such places as Ghana, the Ivory Coast, Mozambique, and Cameroon in the 1990s also generally show a high use of transfusion by pediatric services (Table 5).

One important question that follows is how the blood supply was able to meet this increased demand for transfusion when most expected great difficulty in explaining and convincing African donors to have their blood taken. However, as early as 1960, at a critical juncture on the eve of independence in many African countries, H. E. Crowell, a British physician at Mulago Hospital in Kampala, Uganda, dismissed the potential problem of finding sufficient blood donors. In the section on “Transfusion” in his text on *Non-infectious Disease in Africa*, Crowell stated, “it is not proposed to discuss the social prejudices against blood transfusion in Africa, as within a few years these are usually overcome, and that was usually from the shortage of staff and apparatus, rather than the shortage of donors, which is the limiting factor.” [55] Crowell’s observation was confirmed in other parts of Africa, but Uganda was unusual in how quickly and widespread transfusion was practiced, especially outside the capital. Thus, in 1958, reports show that only 669 of the 2726 units of blood

for transfusion was collected outside the capital of Kampala, but by 1965, that number had grown to 6083 of 17,583 [56] (Fig 4).

Despite taboos, superstitions, and cultural traditions preventing many Africans from donating blood [57,58]—and contrary to the warnings of old colonials based on racist stereotypes—Africans were not very different from potential donors in Europe or America who had reservations and questions about giving blood. There were, however, some important circumstances in Africa that made blood donation different from elsewhere. These included a poor economy and diseases that required different treatment and specific use of transfusion. For example, greater poverty in Africa made the question of payment for blood or provision of a meal or other refreshments much more significant than a token compensation for inconvenience, as it was usually described in France. The offer of cash or a meal not otherwise readily available to Africans was an important motivation for donors [24].

All evidence shows that until recently, men gave blood overwhelmingly more often than women with little difference between regions. A 1951 report of the first 6 months of operation of the Dakar Transfusion Center stated that all 3508 donations were by men [24]. Through the early 1990s, the Rwanda service, which aggressively recruited donors, reported more than 80% of donations from men [51]. Younger donors also gave in higher numbers in Africa than in Europe and America. One reason for the high percentage of young male donors was the early systematic recruitment at military barracks, prisons, and schools by transfusion services that could store blood. As time went by and as disease risk rose, especially for HIV/AIDS, donors in the military and prisons were excluded and the importance of student donors rose accordingly. Although there were more boys in schools, the girls who were enrolled provided by far the largest source of female donors in Africa.

Other differences in the practice of transfusion in poor African countries included frequent shortages of supplies, that is, bottles, bags, and blood drawing sets, plus more basic and widespread problems such as the precarious nature of health and the lack of sufficient infrastructure including widely available and reliable electricity. One of the important consequences of the latter, for example, was the greater difficulty in maintaining supplies of refrigerated, stored blood outside the big cities in Africa.

The response was to recruit donors for immediate transfusion. This was similar to the practice that developed in Europe and America between the world wars, where the local Red Cross branches in Britain and the continental hospital transfusion services established lists (or panels) of pretested and willing donors who could be called when needed to give blood [59]. In Africa when the supply of blood was insufficient, hospitals encouraged patients to bring in family and friends who in many cases, whether known or not by the hospitals, were paid to give blood by the family of the patient. This occurred especially with transfusion for obstetric and pediatric patients in Africa because family members were more likely to feel obligated to provide the blood for the patient. At smaller district hospitals, the blood was used immediately. In larger hospitals that could store blood, this so-called replacement donation required families to donate blood in amounts equal to or in excess of that planned for their family member’s transfusion [60].

This reveals a feature of blood donation that may be more important than the frequently expressed concern whether donors were “voluntary” or paid. For one thing, in Africa, notions of obligation and compensation were different from those in Europe or North America. A more fundamental, if ignored, influence on the motivation for donation was whether blood could be stored or not. For example, the national (or regional) transfusion centers like Nakasero in Uganda or the Dakar center and the new, large urban hospitals such as Ibadan, had electricity and refrigeration for storage. This made it possible to collect and store blood, but that required systems of donor recruitment that had a number of features different from hospitals

Table 5
Transfusions by service, various African hospitals, 1990–1998 [48,52–54]

Hospital service	Kumasi, Ghana (July–August 1990)	Abidjan, Ivory Coast (January 1991)	Maputo, Mozambique (1992)	Yaoundé, Cameroon (1994–1998)
Surgery	29 (10%)	321 (22%)	88 (17%)	(See “Medicine”)
Obstetrics	60 (22%)	306 (21%)	85 (16%)	4855 (18%)
Pediatrics	152 (55%)	370 (26%)	246 (47%)	17 128 (63.5%)
Medicine	37 (13%)	231 (16%)	20 (4%)	4990 (18.5%) ^a
Other		225 (15%)	82 (16%)	

^a Includes surgery.

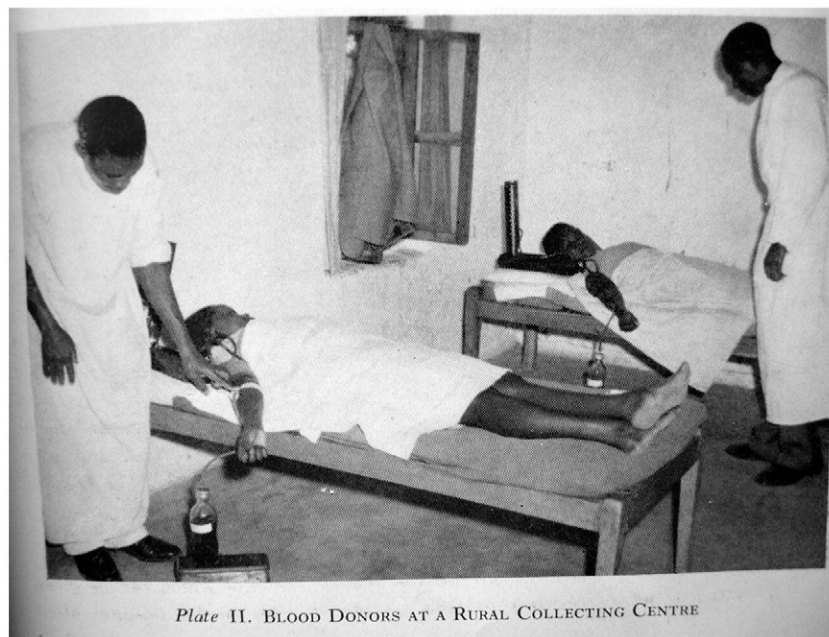


Plate II. BLOOD DONORS AT A RURAL COLLECTING CENTRE

Fig 4. "Blood Donors at a rural collecting centre," Uganda Protectorate. Annual Medical and Sanitary Report. 1953;40–41.

where blood was used immediately. In the latter, patients knew the donors because they or their families were responsible for securing them. In the places where blood was stored, however, the donors were usually unknown to the patients. Hence, they might better be characterized as "anonymous donors," an important distinction. Thus, from the standpoint of motivation, a "debt" was less likely to be incurred in this situation when the donor and recipient did not know one another, whether compensated with money payment or not.

The best way overall to describe the historical response to the need for blood donation in Africa was that it was very flexible. Hospitals had to be innovative in how they adapted to their circumstances, and the resulting amount of blood secured generally met the ability to give transfusions. One way to explain this was that blood was one medicine that Africans possessed in potentially the same amount and with the same control as anywhere else in the world. There were relatively few drug companies, expensive chemical manufacturing, or rare materials involved. As far as donors were concerned, the history of blood transfusion offers a good example of Africans' ability to organize well and adapt their health care to their needs when the materials were available to them.

Blood Safety Before and After the HIV/AIDS Epidemic

There were a number of threats to the blood supply in Africa besides budget cuts and civil strife. Most highly publicized was the AIDS epidemic not just because of mistaken fears of contracting AIDS from donating blood, but more specifically because 2 of the largest sources of donors for stored blood collection ran high risk of infection and were eliminated: prisoners and soldiers. Balancing that loss of donors, the AIDS crisis also brought greater concern to avoid unnecessary use of transfusion plus renewed outside interest in assisting national systems of blood collection, testing, storage, and use [61].

Despite its extreme consequences, the AIDS epidemic was not the first example of risk from blood transfusion in Africa. Historically, those giving transfusions were well aware of risk from the start, and this is not surprising given the disease environment [62]. That does not mean that there was much that could be done to prevent most

disease transmission through transfusion. Malaria is an example of a disease that is not screened to this day in countries where it is endemic, that is, most of sub-Saharan Africa. If potential blood donors with malaria were rejected, the wide prevalence would mean drastically reducing the number of transfusions, and those transfused would face exposure to the disease in any case [63,64].

The blood transfusion practices in sub-Saharan Africa were incapable of detecting the emergence of HIV, as was the case initially with even the most sophisticated screening in developed health care systems. Unfortunately, Africans did not have the resources to improve immediately their ability to detect and screen for the virus once it was recognized. Given the wide use of transfusion, it was therefore an important reason for the initial spread of AIDS [65]. However, most African health officials understood and responded to the new danger, thanks to 40 years of experience and a framework of appreciating long-standing health risks. Both by screening high-risk donors and taking advantage of outside support for testing HIV, as well as technical advice and training, the reduction of HIV transmission through contaminated blood transfusion was one of the quickest and most successful responses to the epidemic in sub-Saharan Africa.

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